Study on the Philips Gauge

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7. Study on the Philips Gauge

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A simple philips type ionization vacuum gauge instrument convenient for the measurement of the low pressure was constructed.

A circuit diagram and the dimension of the discharge tube are similar with that shown in the "High Vacuum Technique" by Dushman.

In the discharge tube, the electrodes were made of Aluminium, the anode was a rectanglar (30×50 m.m.) frame of 7 m.m. in width, and the cathodes of two rectanglar plates (14×18 m.m.) were 28 m.m. apart. 240 gauss Magnetic field was applied with a permanent magnet.

As the A.C. high voltage supply for discharge tube, a 2800 V transformer with adequate stabilizer in the primary circuit was used.

Using this Philips gauge, we have been able to measure the low pressure from 10^{-3} m.m.Hg to 10^{-6} m.m.Hg by exchanging the shunt resistance of D.C. microammeter. For example, when we used 500 KΩ as the current limit resistance, the ion currents were 1.8 mA in 10^{-3} m.m.Hg, and 40μA in 7×10^{-6} m.m.Hg for residual gas.

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8. Studies on the Evacuation of the Large Pumping System

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Four atomic disintegration experiments, it is necessary to know the pumping speed of the diffusion pumps for light gases and design the evacuation pipes and the ion source for proper operations. For this purpose many gas leak methods have been practised with insufficient results. But we divised a new gas leak apparatus by which a gas leakage was adjusted continuously and automatically according to the following equation.

$$q=G\ \exp\ (-Gt/V)$$

Where q is the leak quantity per second, G the conductance of a small leak, V the volume of gas reservoir and t the time.

By this automatic method the pumping speed for hydrogen and duterium was easily known in the range of $8\times10^{-4}\sim3\times10^{-5}$ mmHg. and that for various heater imputs was also measured. The maximum pumping speed of the large diffusion